

WHAT IS CLAIMED IS:

1. A method of reducing emissions from a large, medium speed fuel injected diesel engine of the type used on locomotives subject to transient modes of engine operation in which the engine is accelerated or increased loads are applied, the method comprising:

monitoring at least one operating parameter of the diesel engine;

determining, based on such operating parameter, whether the diesel engine is in a transient mode; and

controlling timing of fuel injection to cylinders of the engine by retarding the timing when the diesel engine is in a transient mode relative to the timing of fuel injection when the diesel engine is not in a transient mode of operation.

2. The method of claim 1 further comprising:

determining, after the diesel engine has been operating in a transient mode, whether the diesel engine is then operating out of the transient mode; and

advancing the fuel injection timing for the diesel engine, if the diesel engine is no longer in the transient mode.

3. The method of claim 1 wherein the controlling timing of fuel injection to cylinders of the engine by retarding the timing, is to more than about 3 degrees after top dead center (TDC).

4. The method of claim 1 wherein the controlling timing of fuel injection to cylinders of the engine by retarding the timing, is to less than about 10 degrees after TDC.

5. The method of claim 1, wherein the determining whether the engine is in a transient mode comprises:

monitoring a parameter indicative of the difference between a commanded engine speed and actual engine speed.

6. The method of claim 1, wherein the determining whether the engine is in a transient mode comprises:

monitoring a parameter indicative of an engine throttle position.

7. The method of claim 1, wherein the determining whether the engine is in a transient mode comprises:

monitoring a parameter indicative of the imposition of a load on the engine.

8. An apparatus for reducing emissions from a large, medium speed fuel injected diesel internal combustion engine of the type used on a locomotive subject to transient modes of engine operation in which the engine is accelerated or increased loads are applied, the apparatus comprising:

a large, medium speed fuel injected diesel internal combustion engine;

an engine monitor for monitoring at least one operating parameter of the engine indicative of whether the engine is in a transient mode of operation;

an electronic fuel injection system in communication with the engine monitor and operatively coupled to the engine, the electronic fuel injection being adjustable so as to selectively initiate fuel injection at a predetermined timing relative to TDC of pistons in cylinders of the engine, the electronic fuel injection system comprising:

a controller for controlling the operation of the fuel injection system;
and

wherein the controller is configured to retard the fuel injection to the engine when the engine is in a transient mode relative to the timing of fuel injection when the engine is not in a transient mode of operation.

9. The apparatus of claim 8, wherein the controller retards the fuel injection timing in each engine cylinder to more than about 3 degrees after TDC.

10. The apparatus of claim 8, wherein the controller retards the fuel injection timing in each engine cylinder to less than about 10 degrees after TDC.

11. The apparatus of claim 8, wherein the engine monitor monitors a parameter indicative of an engine throttle position.

12. The apparatus of claim 8, wherein the engine monitor monitors a parameter indicative of the difference between a commanded engine speed and actual engine speed.

13. The apparatus of claim 8, wherein the engine monitor monitors a parameter indicative of the imposition of a load on the engine.

14. An electronic fuel injection system for reducing emissions from a large, medium speed fuel injected diesel engine of the type used on locomotives subject to transient modes of engine operation in which the engine is accelerated or increased loads are applied comprising:

an engine monitor for monitoring at least one parameter of engine operation indicative of a transient mode of engine operation;

a controller in communication with the engine monitor and a diesel engine; and

wherein the controller is configured to retard a fuel injection to the diesel engine when the diesel engine is in a transient mode relative to the timing of fuel injection when the diesel engine is not in a transient mode of operation.

15. The electronic fuel injection system of claim 14 wherein the controller is further configured to retard fuel injection timing to more than about 3 degrees after TDC.

16. The electronic fuel injection system of claim 14, wherein the controller is further configured to retard fuel injection timing to less than about 10 degrees after TDC.

17. The electronic fuel injection system of claim 14 wherein the engine monitor monitors a parameter indicative of an engine throttle position.

18. The electronic fuel injection system of claim 14 wherein the engine monitor monitors a parameter indicative of the difference between a commanded engine speed and actual engine speed.

19. The electronic fuel injection system of claim 14 wherein the engine monitor monitors a parameter indicative of the imposition of a load on the diesel engine.

20. A storage medium encoded with machine-readable computer program code for electronically controlling timing of fuel injection for a large, medium speed fuel injected diesel engine of the type used on locomotives subject to transient modes of engine operation in which the engine is accelerated or increased loads are applied, the storage medium including instructions for causing a computer to implement a method comprising:

monitoring at least one operating parameter of the diesel engine;
determining, based on such operating parameter, whether the diesel engine is in a transient mode; and

retarding fuel injection timing to cylinders of the engine when a diesel engine is in a transient mode relative to the timing of fuel injection when the diesel engine is not in a transient mode of operation.

21. The storage medium of claim 20 including instructions for causing a computer to implement a method further comprising:

determining whether the diesel engine is out of the transient mode; and
advancing the fuel injection timing for the diesel engine, if it is determined that the diesel engine is no longer in the transient mode of operation.